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EUROPEAN PATENT APPLICATION

21 Application number: 89302902.5

51 Int. Cl.⁴: **B 60 S 1/04**

22 Date of filing: 23.03.89

30 Priority: 24.03.88 JP 68059/88

43 Date of publication of application:
27.09.89 Bulletin 89/39

64 Designated Contracting States: **DE FR GB**

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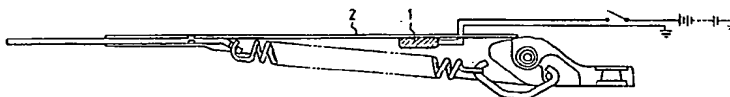
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54 **Windshield wiper.**

57 A wiper device has an oscillator (1) for applying high frequency small amplitude vibration which is actuated in response to the motion of the wiper device. The movement of the wiperblade (3) is forcibly added to the high frequency repetitions of stick and slip conditions. Thus, the chattering phenomenon of the wiperblade (3) is suppressed, and the striped pattern on the windshield is prevented.

FIG. 1



Description

WINDSHIELD WIPER

Field of the Invention

This invention relates to a windshield wiper for use in a vehicle such as an automobile and, particularly, to a windshield wiper which enables to prevent so called chattering phenomenon of the wiper.

Description of Prior Art

It has been recognized that the chattering phenomenon of the windshield wiper is generally caused by the vibration of the wiperblade in the sidewise directions, whereby a generally striped pattern is formed on the surface of the windshield. Therefore, such the phenomenon should be prevented for improving the wiping characteristics

For absorbing the energy of vibration various countermeasures have been proposed which include a wiper having a dead weight on the tip end of the wiperblade so as to increase the inertial force of the wiperblade, a wiper having a movable dead weight on the tip end of the wiperblade and a wiper having a resilient member on the shaft portion or on the wiper arm.

The aim of such prior art devices is to scatter or absorb the vibration energy but not to reduce the energy itself, thus, they may be effective in a specific amount of the energy or in a specific frequency of the vibration, but they are not effective in the case when the amount of the vibration energy is variable.

Further, there are deficiencies in the prior art devices that the weight of the wiper device increases, the load for driving the wiper device increases and that the durability of the wiper device deteriorates.

Further, the wax coated on the outer surface of the vehicle may sometimes flow onto the surface of the windshield which substantially causes the change of the frictional force, thereby the chattering of the wiperblade is induced and the striped pattern is formed on the surface of the windshield. The prior art devices aforementioned are not effective in such phenomena.

The present invention has been made with respect to the circumstances aforementioned, and an object of the invention is to provide a wiper device for suppressing the chattering phenomenon of the wiperblade thereby preventing the striped pattern on the windshield.

Summary of the Invention

According to the invention, there is provided a wiper device having an oscillator being actuated in response to the motion of the wiper device.

The oscillator may be mounted at any desirable point on the wiper device, e.g. on the wiper arm, the wiperblade, or the shaft portion of the wiper device.

The oscillator may be selected among a ceramic piezoelectric element, an electric motor equipped with an eccentric rotor, a sonic element and a crystal element.

The oscillator on the wiperblade acts to generate

the repetitions of minute chattering vibration, which can prevent completely any visible chattering phenomenon and the striped pattern on the windshield.

Brief Description of the Drawings

Further objects and effects of the present invention will become apparent from the following detailed description in conjunction with the drawings, in which:

Fig.1 is an outline of a wiper device according to the present invention;

Fig.2 is a graph showing the movement of a wiperblade according to the present invention, and

Fig.3 is an outline of a wiper device according to another embodiment of the present invention.

Detailed Description of Preferred Embodiments

In analyzing microscopically, the movement of the wiperblade is the repetitions of stick condition and slip condition. then the intervals of the repetitions are increased, which is recognized as so called chattering phenomenon, and thereby a striped pattern may sometimes be observed on the windshield.

Fig. 2 is a graph showing the relation between the time and the distance of the movement of the wiperblade, particularly, at a portion of a blade rubber contacting with the windshield being wiped by the wiperblade. The continuous line in Fig.2 shows the condition when the wiperblade smoothly wipes, and the broken line shows the condition when the severe chattering phenomenon is observed. The horizontal lines of each step show the stick condition where the blade rubber does not move relatively to the windshield, and the vertical lines show the slip condition where the blade rubber moves instantaneously within a limited distance.

The stick condition and the slip condition are caused by the composite function of the frictional force between the blade rubber and the glass and the resilient force of the blade rubber. When the frictional force increases, the blade rubber is excessively pulled on the glass surface and the strain energy is stored in the blade rubber. Then, the resilient force acts to release the strain energy and the frictional force decreases such that the blade rubber slips too much (the slip condition). The next moment, the slip movement of the blade rubber stops momentarily (the stick condition). The repetitions of the slip and stick conditions are observed as the chattering phenomenon. The chattering phenomenon is augmented by the wax, the dirt or dust on the surface of the windshield and an irregular and large amplitude vibration is caused.

Thus, it is possible to suppress or prevent the chattering phenomenon by positively releasing the stick condition or decreasing the duration of the stick condition. The present invention is to apply high frequency vibration positively on the wiper

device thereby forming high frequency repetitions of the stick condition and the slip condition, which suppresses the chattering phenomenon and prevents the striped pattern on the windshield.

According to the invention, an oscillator is provided and is actuated in response to the motion of the wiper device. When the oscillator is actuated during the stationary condition of the wiper device, the blade rubber will excessively be worn and the service life of the wiper device will be deteriorated.

The oscillator may be mounted on any of the wiper arm, the wiperblade and the shaft portion of the wiper device. Fig. 1 shows a preferred embodiment, in which an oscillator 1 is mounted on a wiper arm 2. Fig. 3 shows another embodiment, in which the oscillator 1 is mounted on a wiperblade 3. An electric source for driving the oscillator, a switch, and wire connecting between the electric source and the oscillator 1 are shown schematically in Figs. 1 and 3.

The oscillator may be selected among a ceramic piezoelectric element, an electric motor equipped with an eccentric rotor, a sonic element and a crystal element. The oscillator is preferably driven electrically.

The frequency of vibration should be sufficiently high so that the repetitions of the stick condition and the slip condition cannot be observed visually, and the amplitude of vibration should be sufficiently small not so as to reduce the driving power for the wiper device.

When the direction of the vibration is parallel to the reciprocating movement of the wiperblade, the vibration acts positively to transform into the slip condition, and when the direction of the vibration is normal to the surface of the windshield, the vibration acts periodically to increase or decrease the force pressing the wiperblade against the surface of the windshield whereby the wiperblade is easily released from the stick condition.

According to the invention, the wiper device is forcibly vibrated which enables to sufficiently increase the frequency of the repetitions of stick and slip conditions, thus, the chattering phenomenon of the wiperblade and the striped pattern on the surface of the windshield can effectively be avoided.

Claims

1. A wiper device having an oscillator being actuated in response to the motion of the wiper device.
2. A wiper device according to claim 1, wherein the oscillator is mounted on the wiper arm of the wiper device.
3. A wiper device according to claim 1, wherein the oscillator is mounted on the wiperblade of the wiper device.
4. A wiper device according to claim 1, wherein the oscillator is mounted on the shaft portion of the wiper device.
5. A wiper device according to claim 1, wherein the oscillator comprises a ceramic piezoelectric element.
6. A wiper device according to claim 1,

wherein the oscillator comprises an electric motor equipped with an eccentric rotor.

7. A wiper device according to claim 1, wherein the oscillator comprises a sonic element.

8. A wiper device according to claim 1, wherein the oscillator comprises a crystal element.

9. A wiper device according to claim 1, wherein the direction of the vibration of the oscillator is parallel to the direction of the reciprocating movement of the wiperblade.

10. A wiper device according to claim 1, wherein the direction of the vibration of the oscillator is normal to the surface of the windshield being wiped by the wiperblade.

FIG. 1

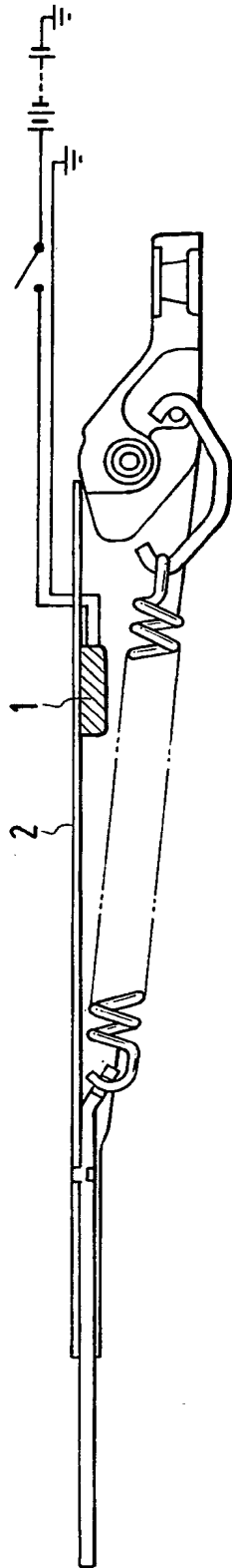


FIG. 2

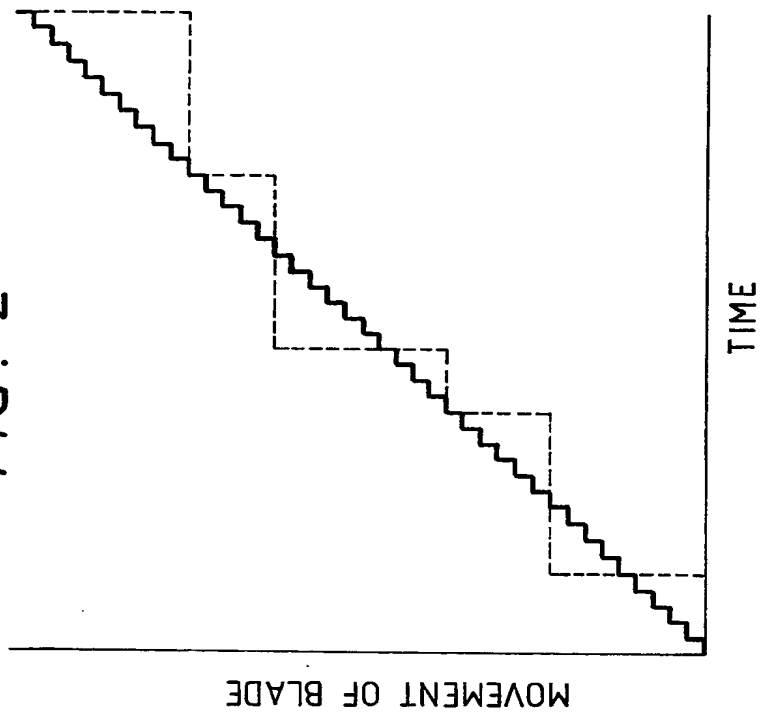
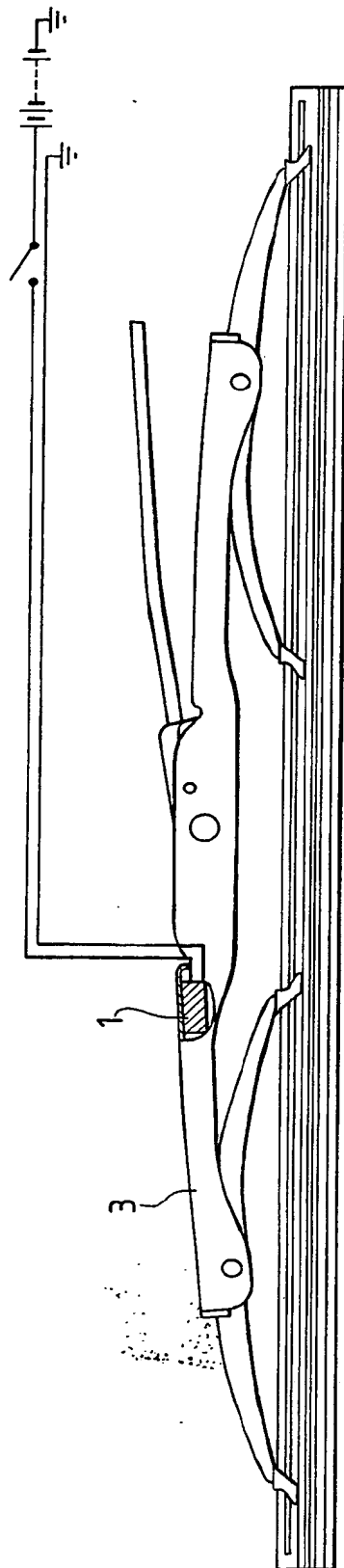


FIG. 3



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(43) Date of publication of application:
27.09.89 Bulletin 89/39

(84) Designated Contracting States: **DE FR GB**

(88) Date of deferred publication of search report:
21.03.90 Bulletin 90/12

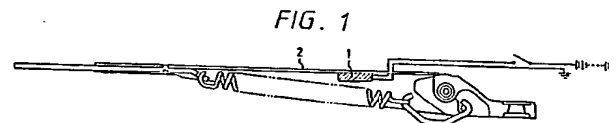
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EP 0 334 651 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 89 30 2902

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	AT-A-319063 (WEISS) * page 3, lines 1 - 10; figures 1, 2 *	1, 2, 10	B60S1/04
A	DE-A-3119888 (MATSUI) ---		
A	FR-A-2139346 (BOSCH) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
			B60S
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 16 JANUARY 1990	Examiner VERLEYE J.
CATEGORY OF CITED DOCUMENTS			
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